UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/566,270	01/30/2006	Tsutomu Fukuda	285291US0PCT	1695

22850 7590 11/18/2009

OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
LI, JUN	

ART UNIT	PAPER NUMBER
1793	

NOTIFICATION DATE	DELIVERY MODE
11/18/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No.	Applicant(s)	
	10/566,270	FUKUDA ET AL.	
	Examiner	Art Unit	
	JUN LI	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-6 and 12-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 4-6, 12-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *06/11/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/13/2009 has been entered.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claim 1, 5-6, 12-16 and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono (US4483940) in view of Giordano et al (Journal of the European Ceramic Society 2002, 22:1811-1822) and Fukuda et al (JP 2002-145659).

Ono teaches a honeycomb carrier supporting a honeycomb catalyst for usage in internal combustion engines including treating exhaust gases (abstract, column 1 lines 24-26), wherein the honeycomb carrier can be any of the ceramic honeycomb carrier including aluminum titanate magnesia (i.e. aluminum magnesium titanate) (column 8 lines 39-45).

Regarding claim 1, Ono fails to specifically teach the component of the honeycomb carrier is a sintered product containing Mg, Al, Ti containing compound with

an empirical formula $Mg_xAl_{2(1-x)}Ti_{(1+x)}O_5$ with addition of alkali feldspar represented by $(Na_yK_{1-y})AlSi_3O_8$ (wherein $0 \leq y \leq 1$).

Giordano teaches sintered product aluminum magnesium titanate with formula of $Mg_{0.1}Al_{1.8}Ti_{1.1}O_5$ and $Mg_{0.5}AlTi_{1.5}O_5$ (abstract) which reads on the recited limitation of Mg, Al, Ti containing compound with an empirical formula $Mg_xAl_{2(1-x)}Ti_{(1+x)}O_5$ with x= 0.1, 0.5. Giordano further teaches that this type of aluminum magnesium titanate compound is made by adding magnesium compound into aluminum titante (Al_2TiO_5) because magnesium can work as a stabilizer to help improve the thermodynamic instability of aluminum titanate (Al_2TiO_5) at high temperature (page 1812 left column second paragraph lines 12-16).

It would have been obvious to one ordinary skill in the art at the time of invention filed to adopt a magnesium modified aluminum titanate compound as shown by Giordano (page 1812 left column second paragraph lines 12-19) to practice the honeycomb carrier of Ono because Ono needs a specific aluminum magnesium titanate without specific describing one while Giordano provides a aluminum magnesium titanate with improved thermodynamic stability.

Fukuda teaches using 1-15 parts by weight of alkali feldspar ($(Na_xK_{1-x})AlSi_3O_8$, $0 \leq x \leq 1$) to increase the mechanical strength and stability of aluminum titanate based sintered compact at 1400-1700 ºC (abstract, machine translated detailed description page 3 paragraph [0012]). Fukuda further teaches that the adding the alkali feldspar can control the grain growth of the sintered compact (machine translated detailed description page 3 paragraph [0014]), achieve a high mechanical, high stability at high

temperature (i.e. high thermal stability), low thermal expansion and a stabilizing crystal structure (abstract, machine translated detailed description page 5 paragraph [0025]).

It would have been obvious to one ordinary skill in the art at the time of invention filed to adopt the alkali feldspar of Fukuda to improve the aluminum titanate product because addition of alkali feldspar can improve the mechanical strength, corrosion resistance, thermal stability of the aluminum titanate as shown by Fukuda. Furthermore, one of ordinary skill in the art would have been obvious to combine the known elements such as magnesium stabilizer as shown by Giordano and alkali feldspar as shown by Fukuda to improve the aluminum titanate for making a desired aluminum magnesium titanate as a honeycomb carrier support for intended uses including internal combustion engines such as automobiles for treating their exhaust gases and depriving them of air pollutants such as nitrogen oxides, carbon monoxides as indicated by Ono (column 1 lines 24-27) and Fukuda (machine translated detailed description page 5 paragraph [0025],[0026]) because magnesium can help improving thermal stability as suggested by Giordano and alkali feldspar can help improving mechanical strength, thermal stability as suggested by Fukuda and combing known elements for predictable results is well within the scope of one ordinary skill in the art.

Regarding claims 5 and 6, Ono teaches using an alkali metal cerium (Ce) (Example 16, column 13 lines 61-62, Example 18, column 14 line 44) to remove nitrogen oxides NO_x from combustion gas burned in a cylindrical combustion apparatus where an air-methane mixed gas containing 3% methane was introduced into and

burned (column 17 lines 14-22). The corresponding catalyst activity for removing NO is shown in Table 6 (column 17-18).

Regarding claim 12 -13 and 16, the recited y and weight range of the alkali feldspar and the recited temperature firing temperature discussed above overlaps with the prior arts, a prima facie case of obviousness exists (See § MPEP 2144.05 [R-5] I).

Regarding claim 14-15, Fukuda further teaches the raw mixture containing TiO_2 and Al_2O_3 and alkali feldspar can be grinded to suitable particle diameter, such as to about 1 μm or less. Fukuda also suggests that there is no particular need about the grade of grinding of a raw material ([0015], [0016]). Thus the recited size is just an obvious modification over the prior art. Furthermore, MPEP points out changes in sizes over prior art cannot make the invention patentable distinct (See § MPEP 2144.04 [R-6] IV).

Regarding claim 18 -20, Fukuda further teaches the sintered compact with addition of alkali feldspar has outstanding erosion proof and corrosion resistance [0025] last 5 lines). It is to be noted that similar composition and similar method of for making a recited honeycomb carrier composition as in the instant applications have been fully disclosed in the applied prior arts, thus similar corrosion resistance associated with addition of alkali feldspar is expected from prior arts' teachings.

Regarding claim 21, Ono in view of Giordano and Fukuda is silent about the recited remaining ratio, however, Ono in view of Giordano and Fukuda already teaches a substantially similar composition, thus similar property such as the recited remaining ratio is expected absent evidence to the contrary.

2. Claim 4 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono (US4483940) in view of Giordano et al (Journal of the European Ceramic Society 2002, 22:1811-1822) and Fukuda et al (JP 2002-145659) as applied to 1, 5-6, 12-16, 18-21, and further in view of Noda (US2001/0056034).

Regarding claim 4, Ono in view of Giordano and Fukuda has been described as above.

Ono further teaches that the cell density of the honeycomb carrier is 300cells/square inch (equals to 46.15 cells/cm^2), reading to the recited limitation of cell density within 15-124cells/ cm^2). Ono also teaches that the thermal expansion of the aluminum titanate magnesium is less than $0.3X10^{-6}K^{-1}$, which overlaps with the thermal expansion coefficient of the instant claim. MPEP clearly states that in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. See MPEP §2144.05 [R5]. It is also noted that the thermal expansion coefficient is a determined physical property with a compound from chosen materials. Since the honeycomb carrier material is an obvious modification over prior art, thus the associated thermal expansion coefficient is also expected.

Ono in view of Giordano and Fukuda fails to expressly teach that the honeycomb carrier has a wall thickness from 0.05-0.6mm, and the porosity of the partition wall is 20-50%.

Noda teaches that the honeycomb carrier made from aluminum titanate with addition of Mg can have a porosity of 5-50%, preferably 10-40% (page 2 paragraph [0014]), which reads onto the recited limitation of porosity of 20-50% in the instant claim

4. Noda indicates that probably porosity is needed to maintain probable honeycomb carrier strength and suppresses the diffusion of alkali metal or alkaline earth metal catalyst into the carrier ((page 2 paragraph [0014]). Noda further teaches that a wall thickness of 0.05-0.1mm with a cell density 62-139.5 cells/cm^2(page 2 paragraph [0023]), reading into the recited limitation of the partition wall thickness of 0.05-0.6mm and cell density 15-124 cells/cm^2 in the instant claims. Noda also indicates that probable porosity and cell density can ensure good cell structure of honeycomb carrier with good bending strength and thermal expansion coefficient (less than $3.0X10^{-6}$ K^{-1}) for effectively purifying NO_x from exhaust gas (page 3 table 1, paragraph [0028]).

It would have been obvious to one ordinary skill in the art at the time of the invention filed to adopt the porosity and cell density of Noda to improve the honeycomb carrier structure of the combined references. One ordinary skill in the art would have been motivated to do so because probable porosity and cell density can ensure good cell structure of honeycomb carrier with good bending strength and thermal expansion coefficient to effectively purify NO_x from exhaust gas (page 3 table 1, paragraph [0028]) and probable porosity can well suppresses alkali metal or alkaline earth metal catalyst into the carrier to ensure the durability of the catalyst (page 2 paragraph [0014] and page 3 paragraph [0029] lines 5-12).

Regarding claim 17, Ono in view of Giordano and Fukuda fails to expressly teach the catalyst comprising potassium.

Ono further teaches alkali metals can be used as honeycomb carrier supported catalyst component (column 2 lines 53-58) and Noda further teaches alkali metals including K can be used as catalyst (page 1 [0004]).

One of ordinary will have been obvious to use potassium as the catalyst component for purifying exhaust gas as shown by Noda because potassium is one of well known alkali metal catalyst component used in the art as shown by Noda and adopting known technique for improving efficiency of similar method/product is well within the scope of one ordinary skill in the art.

Response to Arguments and Affidavit

Applicant's arguments and affidavit filed on 10/13/2009 have been fully considered but they are not persuasive. In response to applicant's argument, Ono fails to specifically teach the honeycomb carrier with the recited aluminum magnesium titanate formula with addition of alkali feldspar, it is noted that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Furthermore, Ono teaches aluminum magnesium titanate can be used as honeycomb carrier, Giordano teaches magnesium can be used as a stabilizer for improving thermodynamic stability of aluminum titanate and Fukuda teaches addition of alkali feldspar can improve the thermal stability, mechanical strength and corrosion resistance of aluminum titanate, thus the improved thermal stability due to addition of magnesium

addition (Ex 2-1 as compared to Ex 2-2 shown in Fig 2, Ex1-1 as compared to Ex2-1 Fig 3 affidavit) and the improved thermal stability due to addition of alkali feldspar (Ex2-1 as compared to comparative Ex2-1 Fig 2, and Ex1-1 with comparative example 1-1 Fig 3 affidavit) are all expected from the prior arts' teachings. For the substantially similar composition, substantially similar properties such as recited in the instant claims are expected absent evidence to the contrary. Noda teaches a catalyst carrier material can be aluminum titanate with addition of magnesium ([0012]) and a probable catalyst carrier wall thickness and porosity is needed for catalyst's good performance and the catalyst can include potassium as set forth in the rejections. Ono teaches honeycomb carrier material can be different types of modified aluminum titanate including aluminum magnesium aluminum titanate as set forth in the rejection. It would have been obvious to one of ordinary skill in the art to combine known elements such as magnesium taught by Giordano and alkali feldspar as taught by Fukuda to make a improved aluminum magnesium titanate as a honeycomb carrier because magnesium can help improve thermal stability and alkali feldspar can help improve mechanical strength, thermal stability and combining known elements for predictable results is well within the scope of one ordinary skill in the art.

Thus the alleged superior results are all expected from the applied references. The claimed subject matter is not patentable distinct over the prior arts.

Conclusion

All the claims are rejected for the reasons of record.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JUN LI whose telephone number is (571)270-5858. The examiner can normally be reached on Monday-Friday, 8:00am-5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis Mayes can be reached on 571-272-1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JUN LI/
Examiner, Art Unit 1793
10/23/2009

/Melvin Curtis Mayes/
Supervisory Patent Examiner, Art Unit 1793